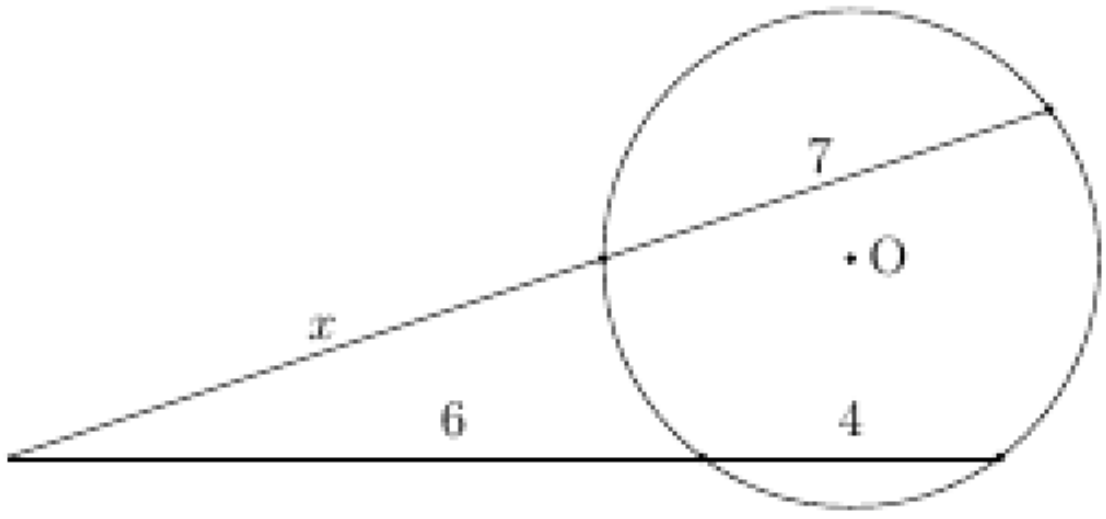
Topic: Intersecting tangents and secants

Question: Given the lengths in the figure, solve for the missing value. The figure may not be drawn to scale.

Find x.



Answer choices:

A $x = 3$

B $x = 4$

C $x = 5$

D $x = 6$

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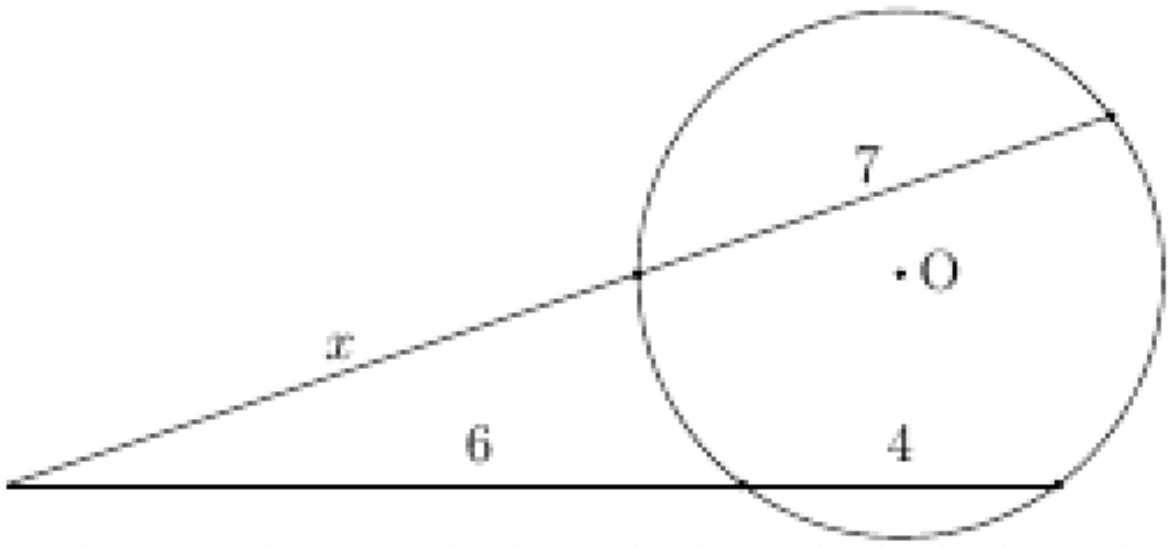
Solution: C

Because there are two secants intersecting, we can follow the pattern

$$\text{outside} \cdot \text{whole} = \text{outside} \cdot \text{whole}$$

Plugging the lengths from the figure



into this equation, we get

$$x(x+7) = 6(6+4)$$

$$x^2 + 7x = 60$$

$$x^2 + 7x - 60 = 0$$

$$(x+12)(x-5) = 0$$

$$x + 12 = 0$$

$$x = -12$$

or

$$x - 5 = 0$$

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$$x = 5$$

A line segment can't have a negative length, so rule out $x = -12$ and conclude that $x = 5$.

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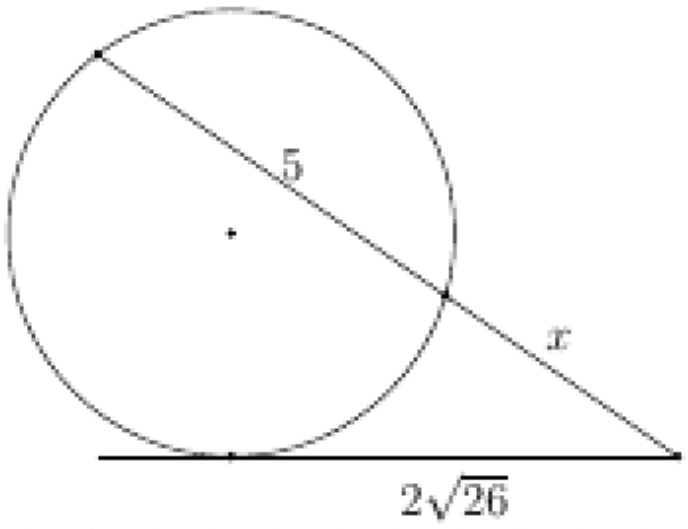
Find x.



Answer choices:

A $x = 5$

B $x = 6$

C $x = 7$

D $x = 8$

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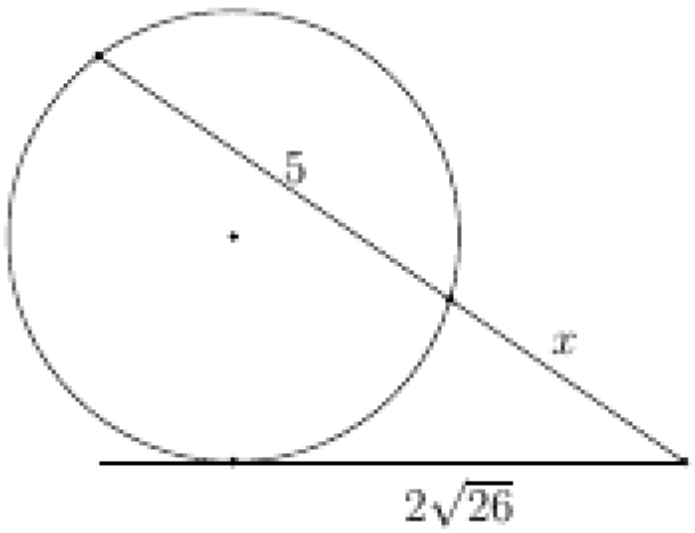
Solution: D

Because there is a secant intersecting with a tangent, we can follow the pattern

$$\text{outside} \cdot \text{whole} = \text{tangent}^2$$

Plugging the lengths from the figure



into this equation, we get

$$x(x+5) = \left(2\sqrt{26}\right)^2$$

$$x^2 + 5x = 104$$

$$x^2 + 5x - 104 = 0$$

$$(x+13)(x-8) = 0$$

$$x + 13 = 0$$

$$x = -13$$

or

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$$x - 8 = 0$$

$$x = 8$$

A line segment can't have a negative length, so rule out $x = -13$ and conclude that $x = 8$.

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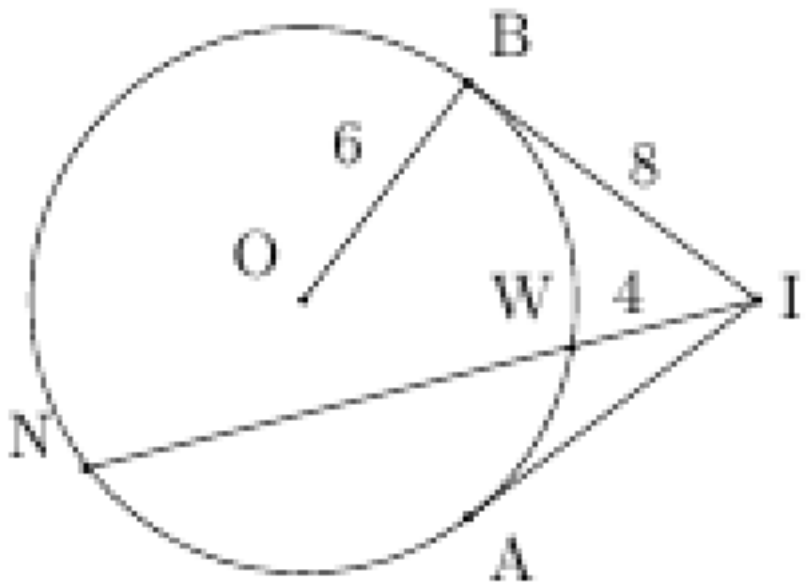
Topic: Intersecting tangents and secants

Question: Find the indicated value.

In the given figure, $\overline{IB}$ and $\overline{IA}$ are tangent to $\odot O$ at points B and A. Given the lengths shown, find $m\overline{NW} + m\overline{IA}$. The figure may not be drawn to scale.



Answer choices:

A 12

B 14

C 18

D 20

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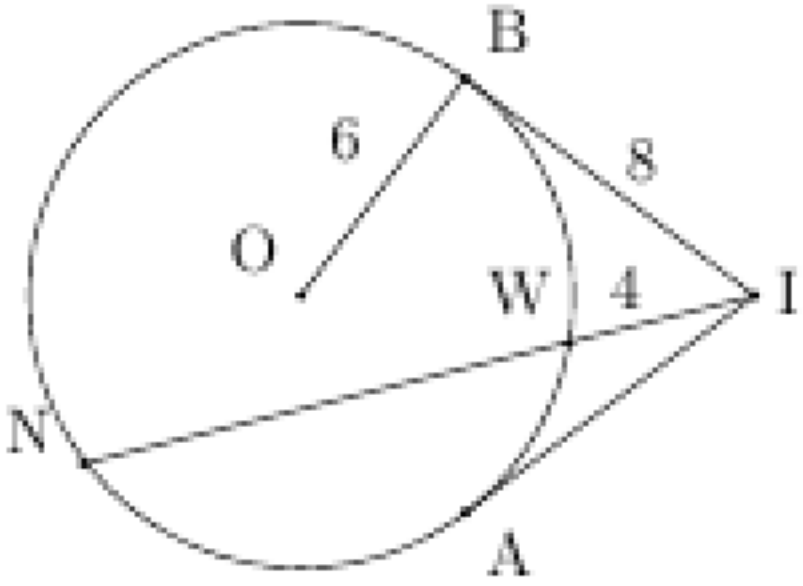
Solution: D

Since $\overline{IB}$ and $\overline{IA}$ are tangents from the same point, they have equal lengths. That tells us that $m\overline{IA} = 8$.



Next, you can use the pattern

$$\text{tangent}^2 = \text{whole} \cdot \text{outside}$$

Let $m\overline{NW} = x$ and write

$$8^2 = 4(x + 4)$$

$$64 = 4x + 16$$

$$48 = 4x$$

$$x = 12 = m\overline{NW}$$

Therefore,

$$m\overline{NW} + m\overline{IA} = 12 + 8 = 20$$

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